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(58) Field of Search

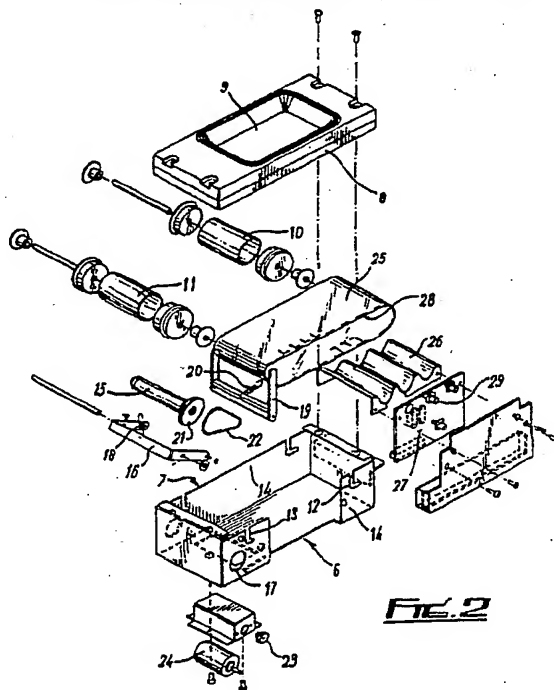
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(54) Reel mechanism for entertainment machine

(57) In a reel mechanism for a coin-operated entertainment machine, such as a fruit machine, a symbol-bearing band (25) which runs around rollers (10, 11) is driven by a pinch roller (15) connected to a d.c. motor (24), and a control circuit (27) is provided to ensure that the band (25) can be arrested in precise registration with a selected stopping position. The control circuit (27) may act to reverse the power supply for a short period of time when the band (25) is arrested. Markers (28) are optically scanned on the edge of the band (25) to determine its position. In an alternative embodiment, the d.c. motor may be used to drive a drum-type reel.



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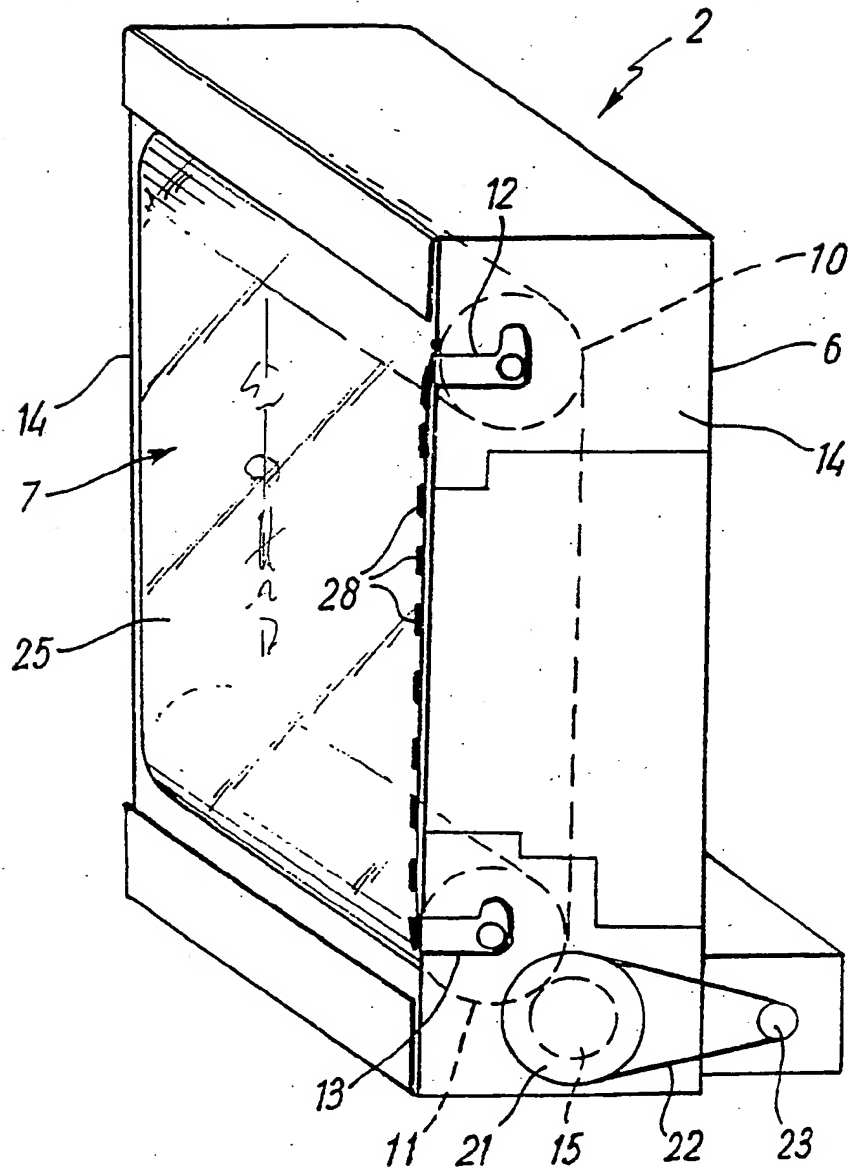


FIG. 1

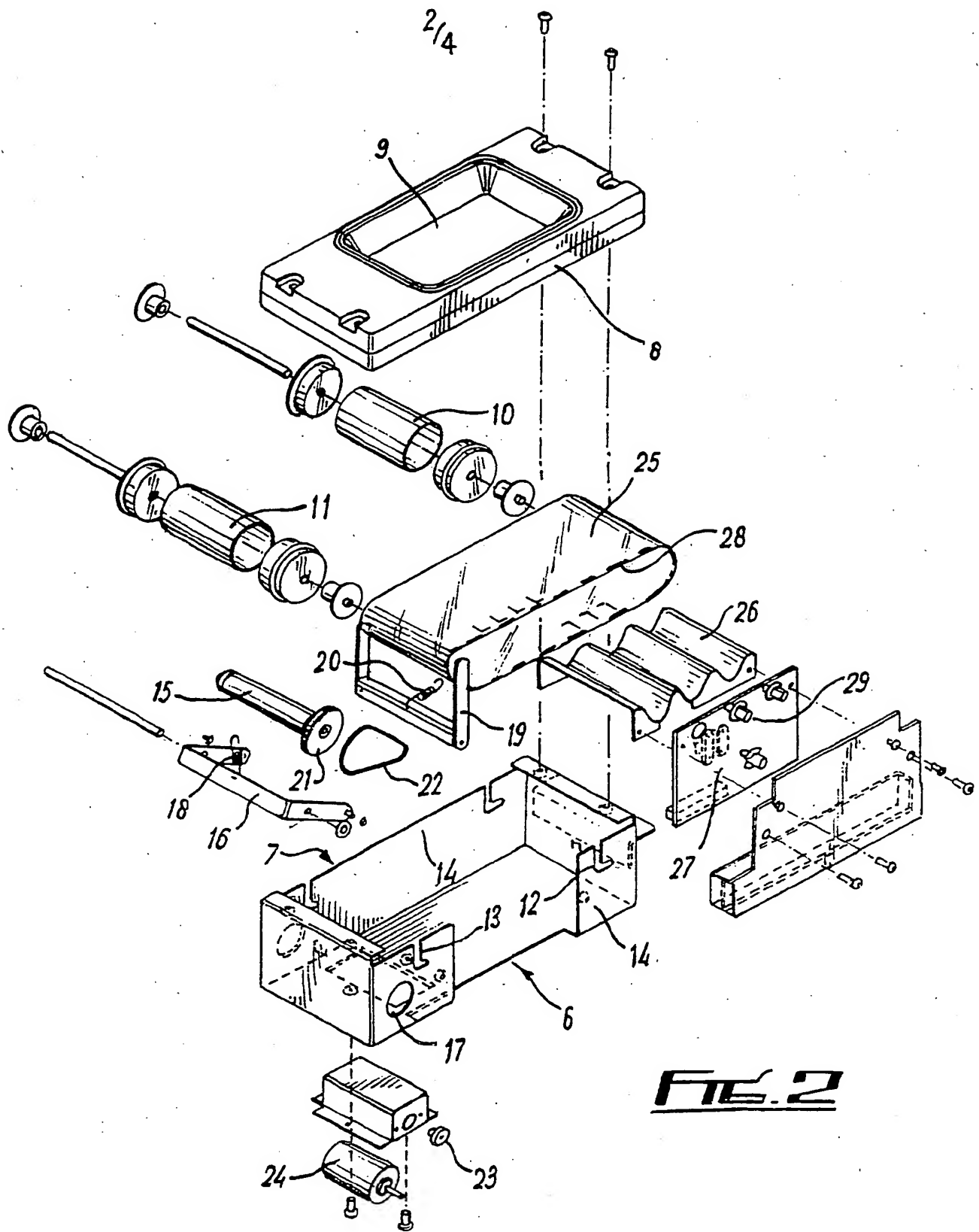


FIG. 2

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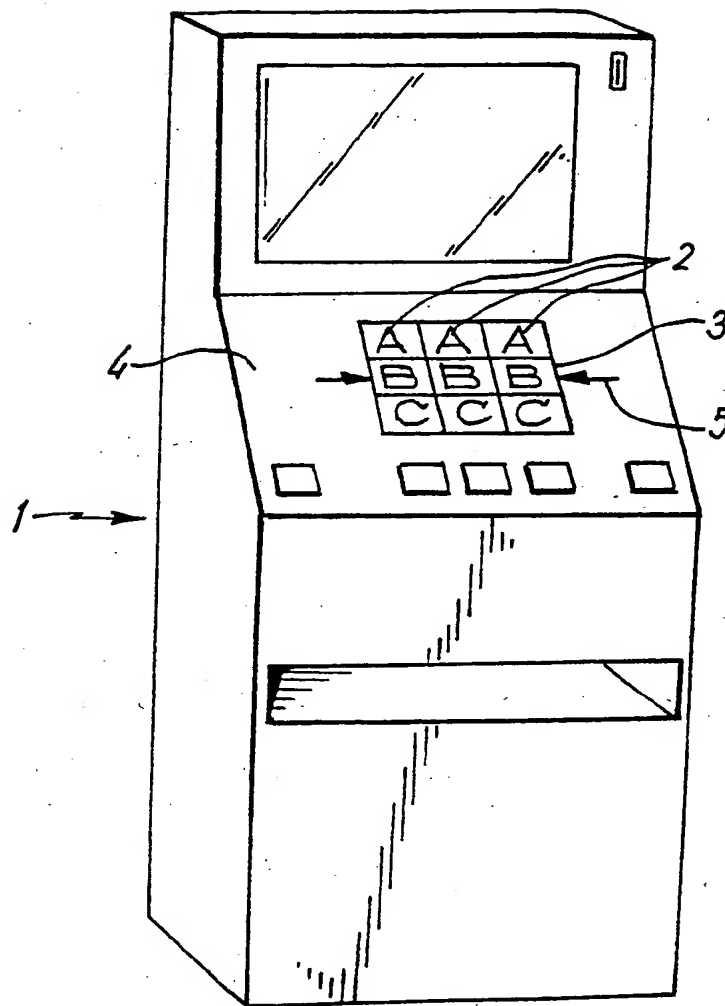
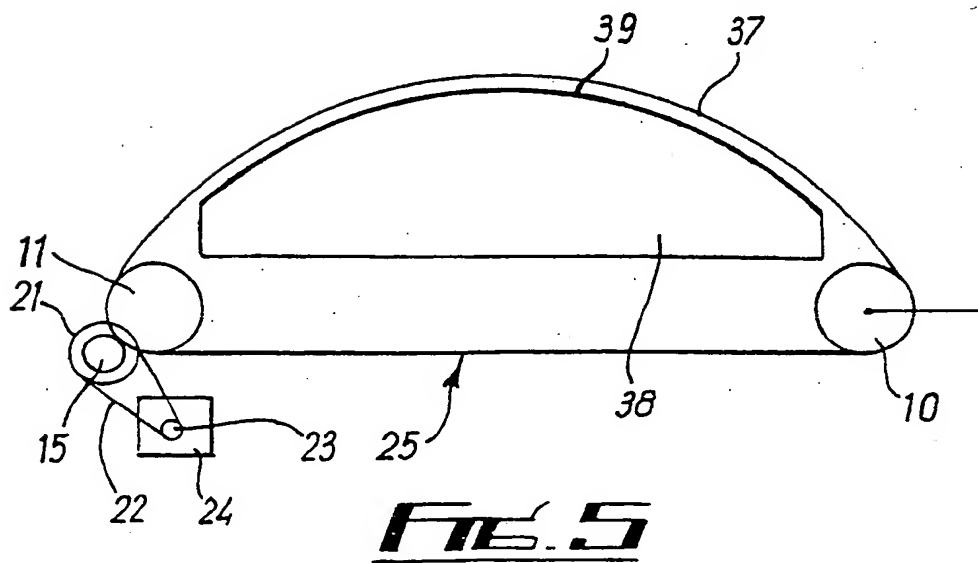
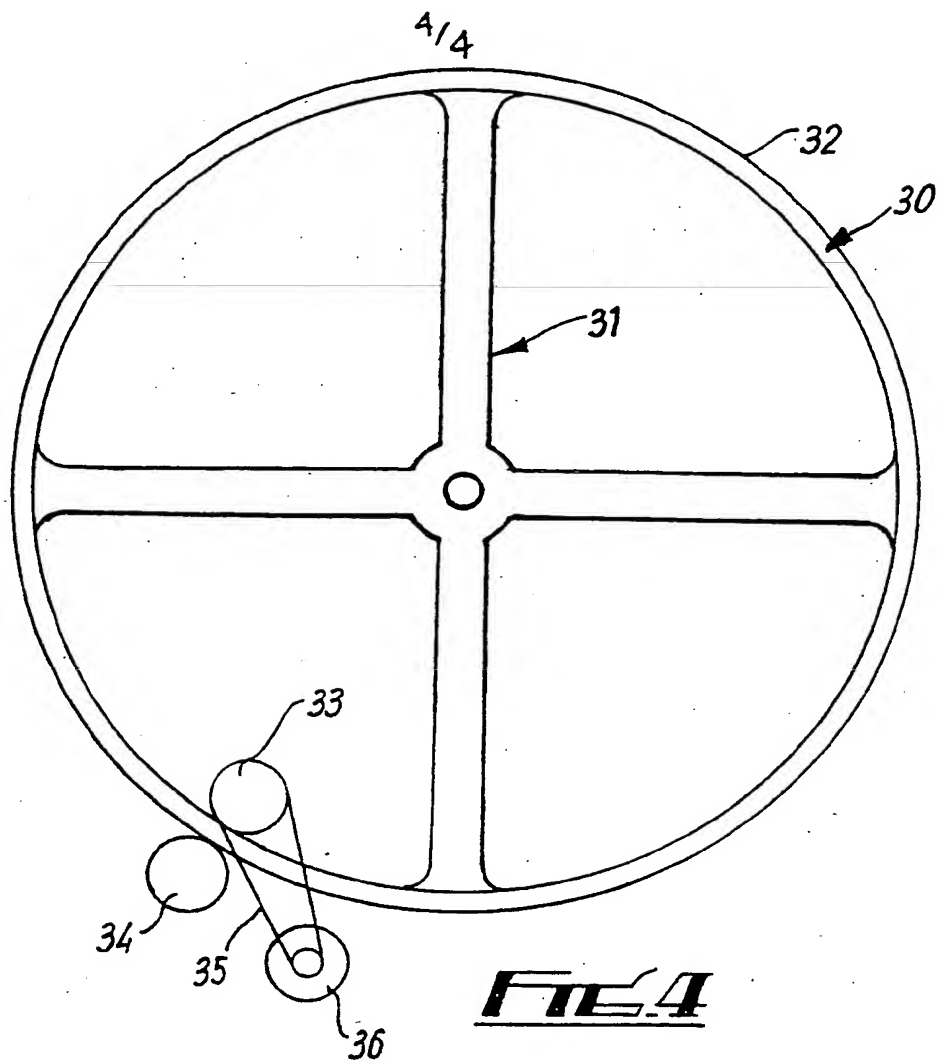


FIG. 3



ENTERTAINMENT MACHINESTECHNICAL FIELD

This invention relates to a reel mechanism for a coin-operated entertainment machine. The term coin-operated as used herein is intended
5 to cover operation by coins, tokens, credit or charge cards or any other means of establishing credit or monetary value.

BACKGROUND ART

A reel-type coin-operated entertainment machine of the fruit machine or poker machine kind usually has three or four circular drum-shaped reels
10 with symbols around their peripheries. The reels are rotated and then brought to rest, typically using stepper motor drives, to display a combination of the symbols through a window on one or more win lines.

With an alternative known reel mechanism the symbols are provided on a band which runs between spaced rollers. With this arrangement a more
15 compact generally flat construction can be attained.

GB 2150335-A describes a flat reel mechanism having a band with perforations along one edge which are engaged by a toothed wheel driven by an electric motor. Markings along the opposite edge of the band are monitored using photoelectric cells to provide information as to the location
20 of the symbols.

It is desirable for such a band-type flat reel mechanism to be constructed as a simple, rugged essentially self-contained unit thereby to ensure operational reliability and to facilitate economic machine manufacture.

It is also desirable for the band of the mechanism to run freely and

stop promptly to provide user-appeal by simulation of a drum-type reel and also to ensure accurate registration of a symbol, when the band is stopped, with a win-line or display region.

DISCLOSURE OF THE INVENTION

5 An object of the present invention is to provide a drive system which gives enhanced possibilities for manufacture of improved reel mechanisms and in particular enables the above mentioned desired characteristics to be conveniently realised in the context of band-type reel mechanisms.

10 According to the invention therefore there is provided a reel mechanism for a coin-operated entertainment machine having a rotatably mounted display member bearing symbols, a drive mechanism for driving and stopping the member comprising an electric motor, characterised in that the electric motor is a d.c. motor provided with a control circuit operable to stop the member in registration with one of a plurality of predetermined stopping positions.

15 By using a d.c. motor-driven pinch roller smooth drive and accurate stopping can be attained with a particularly simple, hard wearing and compact construction.

20 Preferably the d.c. motor is geared to facilitate arrest of the motor and hence the member when power to the motor is switched off.

 Preferably also, the control circuit operates to reverse the power to the motor for a short period of time when the member is arrested to compensate for over-run and ensure stopping in accurate registration.

 Most preferably (although not exclusively), the invention is applied to

a display member which is a band mounted to run around guides, the drive mechanism also comprising a pinch roller which is connected to the motor.

The positioning of the band is preferably determined by monitoring at least one marker on the band. Conveniently this may be achieved with an optical system whereby the marker or markers are scanned with a light beam and changes in light transmission or reflection are detected. By way of example, each symbol may have a respective marker and one such marker is distinguished (e.g. by its size) as a reference marker whereby the optical system permits the determination of a marker count (and hence a symbol position count) starting from the reference marker. Conveniently the markers may comprise darkened areas along a light-transmitting edge region of the band. In addition to providing a position count it is also possible to determine band speed by monitoring the time between markers whereby a speed adjustment can then be effected as desired.

Instead of an optical system it is possible to use any other suitable position monitoring system using any suitable radiation, contact or proximity detection system.

With regard to guidance, preferably the band is an endless band running around spaced rollers. There may be two such rollers with the band running along straight paths which may be parallel to each other thereby to give a compact essentially flat construction. It is however also possible to use angled and/or curved paths as desired.

Preferably one or more rollers or other guide means is spring loaded to tension the band.

The reel mechanism is preferably in the form of a unit comprising the band, the drive mechanism, the guides for the band, and also the control circuit. The unit may also incorporate a front cover with a window and means for back illumination of the band.

5 A plurality of like said reel mechanisms may be used side-by-side (say three or four mechanisms) in a coin-operated entertainment machine.

As stated, the invention is not restricted to band-type reel mechanisms. The present invention may also be applied to other kinds of reels, particularly drum reels.

10 Thus, and in accordance with a further aspect of the present invention there is provided a reel mechanism for a coin-operated entertainment machine having a movable symbol-bearing member, and a drive mechanism for driving and stopping the member, characterised in that the drive mechanism comprises a drive member driven by a d.c. electric motor
15 provided with a control circuit operable to stop the symbol-bearing member in registration with one of a plurality of predetermined stopping positions.

The movable symbol-bearing member may comprise a drum reel, and the drive member may comprise a rotatable friction member, such as a wheel or roller engaging the drum internally or externally. Other kinds of
20 drive members are also possible. For example, the d.c. motor may drive a toothed wheel engaging teeth moulded around the drum. The drive member may even be part of the drum, such as a drum spigot linked by a band to the d.c. motor. Any other suitable kind of positive or friction drive may be used. Other features of the drum may be conventional. Other features of the drive

mechanism may be as hereinbefore described in connection with the first aspect of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described further by way of example only and with reference to the accompanying drawings in which:-

Fig. 1 is a diagrammatic perspective view of one form of a reel mechanism according to the invention;

Fig. 2 is an exploded perspective view of the reel mechanism;

Fig. 3 is a front perspective view of an entertainment machine incorporating multiple reel mechanisms as shown in Figs. 1 and 2;

Fig. 4 is a diagrammatic side view of an alternative form of reel mechanism according to the invention; and

Fig. 5 is a diagrammatic side view of a modified version of the reel mechanisms of Figs. 1-3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 3 shows a typical coin-operated entertainment machine having a housing 1 containing three side-by-side reel mechanisms 2 visible through a window 3 in a front panel 4 of the housing 1.

After actuation of the machine with coins the reel mechanisms 2 are operated to select a combination of symbols which are then displayed through the window 3 on a horizontal win line 5. An award is made available to the player in the event that the selected combination is a predetermined winning combination.

Each reel mechanism 2 is in the form of a self-contained unit having a rectangular box-shaped metal housing 6 which is open at its front 7. A cover plate 8 with a central rectangular window 9 fits over this open front 7.

5 At each end of the housing 6 there is a respective end roller 10, 11 which is freely rotatably mounted on a spindle located in slots 12, 13 in the opposite side walls 14 of the housing 6. At one end there is a pinch roller 15 which is freely rotatably mounted on a spindle which is supported in opposite arms of a U-shaped cradle 16 which is pivotally mounted at its free
10 ends on the opposite side walls 14. The ends of the pinch roller 15 fit within holes 17 in the side walls 14 with sufficient freedom to permit the pinch roller 15 to pivot with the cradle 16 into engagement with the adjacent end roller 11. The axes of the rollers 10, 11, 15 are all parallel to each other and perpendicular to the side walls 14.

15 The cradle 15 is linked by a spring 18 to the housing 6 to urge the pinch roller 15 into engagement with the adjacent end roller 11. The opposite end roller 10 is connected to the free ends of a U-shaped cradle 19 which is pivotally mounted on the end walls. This cradle 19 is linked by a spring 20 to the housing 6 to urge the cradle 19 and hence the roller 10
20 towards the adjacent end of the housing 6 along the slots 12.

At one end, the pinch roller 15 projects beyond the side wall of the housing and has thereon a pulley wheel 21 which is connected by an O section rubber belt 22 to a smaller pulley wheel 23 on a highly geared d.c. electric motor 24 mounted on the housing 6.

A transparent flexible endless band 25 is located within the housing 6 and passes around the two end rollers 10, 11, between the pinch roller 15 and the adjacent end roller 11. The band 25 has straight mutually parallel front and back runs and is held taut by the spring 20. The other spring 18
5 holds the band 25 gripped between the pinch roller 15 and the adjacent end roller 11.

Between the runs of the band 25 there is a reflector assembly 26 with bulbs whereby the front run of the band 25 can be back illuminated.

At the side of the housing there is a printed circuit board 27
10 containing control circuitry connected to the bulbs and to the electric motor 24. The circuitry includes a programmed chip which controls the motor 24, flashing of the bulbs and also position sensing as discussed below.

The band 25 is printed with symbols at regularly spaced intervals along its length. Along one edge there are black marker bars 28, one for
15 each symbol position. One marker 28 is a reference markers 28 of larger dimensions. The other markers 28 are all of equal dimensions. Optical sensors 29 are mounted alongside the edge of the band 25 having the marker bars 28 so as to receive light from a light source by reflection from or transmission through such edge. The sensors 29 are also connected to
20 the above mentioned control circuitry.

In use, under the control of the control circuitry, d.c. power is fed to the electric motor 24 to drive the pinch roller 15 and thereby cause the band 25 to run smoothly around the rollers 10, 11.

The sensors 29 monitor the passage of the markers 28. The

reference marker is identified and then successive other markers 28 are counted. At the same time the time duration between markers 28 is noted and the supply of power to the motor 24 is adjusted, as necessary, to maintain the speed constant.

5 When it is desired to stop the band 25, the power to the motor 24 is switched off when the sensors 29 indicate that three markers 28, and hence the corresponding three symbols on the band 25, are in predetermined stopping positions. The aim is to stop the band 25 with three symbols visible centrally in the window 9 in the cover plate 8 whereby the middle
10 symbol will be in precise registration with the win line 5 in the window 3 of the front panel 4 of the machine.

 The power is therefore switched off when the markers 28 are at or immediately behind the desired stopping position. The high gearing of the motor 24 ensures prompt stopping. To compensate for slight over-run, the
15 power supply to the motor 24 is reversed for a very short period of time to move the band 25 backwards through a very short distance thereby to achieve exact registration.

 The visual effect of this is a slight tremor which is appealing in so far as it helps to simulate movement and stopping of a rotatable drum-type reel.

20 On stopping, the position of the band 25 is known due to the count derived from the markers 28 and sensors 29. This information is then used, together with that derived from the other reel assemblies to enable the main control circuit of the machine to evaluate the displayed symbol combination for win assessment purposes.

With this arrangement, the reel assembly can be constructed as a rugged compact unit which is simple and inexpensive to manufacture and convenient to install. The use of a reversible d.c. motor with on-board control circuitry facilitates accurate reliable operation.

5 Although described above in relation to flat band-type reel mechanisms, the d.c. motor drive may also be applied with advantage to other kinds of reels, particularly drum reels, and to other band configurations as described hereinafter with reference to Figures 4 and 5.

10 Fig. 4 shows in diagrammatic side view one form of a drum-type reel mechanism according to the invention.

The drum comprises a cylindrical rim 30 mounted on and fixed to a radially extending support structure 31. The support structure is axially rotatably mounted at its centre in conventional manner.

15 The outer surface of the cylindrical rim 30 has a translucent band 32 attached thereto with symbols marked at regularly spaced positions. These symbols can be back illuminated through apertures in the rim 30.

The rim 30 has an internal smooth peripheral surface which is engaged by a rotatably mounted friction roller 33. An external freely rotatable roller 34 may be provided to define a nip with the inner roller 33.

20 The internal friction roller 33 is connected via a drive band 35 to a d.c. electric motor 36 which is provided with a control circuit (not shown) which operates in identical manner to the d.c. motor and control circuit of Figs. 1-3.

Positioning of the drum reel is detected, in like manner to the

embodiment of Figs 1-3 using a photosensor and markings around the periphery of the symbol band.

With this arrangement, a conventional drum-type reel can be driven with a mechanism which is less expensive than a conventional stepper motor drive. There is no need for complex drive software as is the case with
5 stepper motors.

Fig. 5 shows a modification of the embodiment of Figs. 1 to 3 (and the same reference numerals are used for the same parts) the difference being that the front run 37 of the band 25 is curved, or arcuate instead of
10 straight. This is achieved with the aid of a back illumination reflector assembly 38, or light box, which has a correspondingly curved front guide surface 39, instead of the straight-fronted light box 26 of Figs. 1 to 3. The band 25 runs over and in contact with this curved guide surface 39 and a suitable finish or intervening structure or means is provided to minimise
15 friction or snagging. In particular, the guide surface 39 may comprise a smooth low friction (e.g. silicone-coated) surface.

The above embodiments provide self-contained, removable and insertable units which present considerable practical advantages.

Reel assemblies can be serially linked, and true replacement
20 compatibility can be achieved between reel units as the type of d.c. motor etc does not affect the software. That is, with conventional stepper motors, the drive for each reel is connected independently to the main control unit which has to be programmed to provide appropriate digital signals for that particular drive. With the above described embodiments

each reel assembly has its own local microprocessor-based control unit.

This means that the main control unit can be programmed to provide standardised control signals which are received by the respective local control units on a serial bus and which initiate control of the respective drive through the action of the respective local unit. Reel assemblies with different motors can all be compatible with the same main control unit without requiring special reprogramming. Also, by use of serial bus communications, connections can be much simplified.

It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiments which are described by way of example only.

CLAIMS

1. A reel mechanism for a coin-operated entertainment machine having a rotatably mounted display member (25) bearing symbols, a drive mechanism (21-24) for driving and stopping the member (25) comprising an electric motor (24), characterised in that the electric motor (24) is a d.c. motor provided with a control circuit (27) operable to stop the member (25) in registration with one of a plurality of predetermined stopping positions.

2. A reel mechanism according to claim 1 characterised in that the d.c. motor (24) is geared.

3. A reel mechanism according to claim 1 or 2 characterised in that the control circuit (27) operates to reverse the power to the motor (24) for a short period of time when the band is arrested.

4. A reel mechanism according to any one of claims 1-3 characterised in that, the display member (25) is a band mounted to run around guides 10, 11, and the drive mechanism also comprises a pinch roller (21) which is connected to the motor (24).

5. A reel mechanism according to claim 4 characterised in that the positioning of the band (25) is determined by monitoring at least one marker (28) on the band.

6. A reel mechanism according to claim 5 characterised in that the or each marker (28) is arranged to be scanned with a light beam.

7. A reel mechanism according to any one of claims 4 to 6 characterised in that said guides comprise spaced rollers (10, 11).

8. A reel mechanism according to any one of claims 4 to 7 characterised in that the band (25) runs along straight paths between the guides (10, 11).

9. A reel mechanism according to any one of claims 4 to 8 characterised in that the band (25) runs along at least one curved path (37) over a curved guide surface (39).

10. A reel mechanism according to any one of claims 4 to 9 characterised in that at least one said guide (10) is spring loaded to tension the band (25).

11. A reel mechanism according to any one of claims 4 to 10 characterised in that the mechanism is in the form of a unit comprising the band (25), the drive mechanism (21-24), the said guides (10, 11) and the control circuit (27).

12. A reel mechanism according to claim 11 characterised in that the unit further includes means (26) for back illumination of the band (25).

13. A reel mechanism according to claims 9 and 12 characterised in that the means for back illumination is a light box (38) which provides said curved guide surface (39).

14. A reel mechanism for a coin-operated entertainment machine having a movable symbol-bearing member (30), and a drive mechanism (33-36) for driving and stopping the member, characterised in that the drive mechanism comprises a drive member (33) driven by a d.c. electric motor (36) provided with a control circuit (27) operable to stop the symbol-bearing member (30) in registration with one of a plurality of predetermined stopping positions.

15. A reel mechanism according to claim 14 characterised in that the control circuit (27) operates to reverse the power to the motor (24) for a

short period of time when the band is arrested.



Application No: GB 9504441.8
Claims searched: 1 to 15

Examiner: Mr. G. Nicholls
Date of search: 27 March 1995

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.N): G4V (VAA VBK)

Int Cl (Ed.6): G07F 17/34

Other: ONLINE : WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2067810 A (QUESTENCO) See especially page 3 lines 50-52	1,2,14
A	GB 2065352 A (JPM) Whole document	1,14
X	GB 2052823 A (HEYWOOD) Whole document	1,4-6, 9,12,14
X	GB 2029065 A (JPM) See especially page 1 lines 54-65	1,14
X	GB 1550732 (PBR ELECTRONIC DESIGNS) See especially page 2 lines 28 and 29	1,2,14
XP	EP 0629980 A1 (GESTION DE PATENTES) See especially Column 3 line 9 and Column 7 lines 31-33	1,2,9,14

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